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Summary of the Recovery Plan for the Northern Spotted Owl - DRAFT

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Summary of the Draft Recovery Plan for the Northern Spotted Owl

April, 1992

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This booklet is a summary of the Recovery Plan for the Northern Spotted Owl - DRAFT, *and describes and summarizes in general terms the concepts, information, and recommendations presented in that document. The recovery plan outlines steps necessary to bring about recovery of the northern spotted owl. If you need the technical detail and maps that are in the complete plan, mail your request to:*

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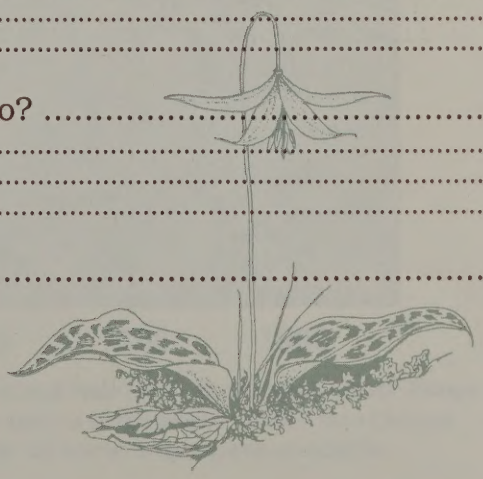


Fawn lily *(Erythronium revolutum).*

In a Nutshell...

Why does the northern spotted owl need a recovery plan?

The Endangered Species Act, a federal law passed in 1973, requires that a recovery plan be prepared for any species that becomes federally listed as "threatened" or "endangered." Species are listed when evidence shows that existing conditions and trends in land use are leading them toward extinction. A recovery plan is written to guide actions needed to get the species off the list, and return it to a condition where it no longer requires the special protections of the law. The northern spotted owl was listed as a threatened species on June 26, 1990, because the available evidence indicated that management of its habitat was leading it toward extinction (see Figure 1).

The listing launched a detailed effort to provide protection for northern spotted owls and their remaining habitat. Unfortunately, much of this habitat is the same remnant old-growth forest that the region's timber industry planned to harvest in the near future. The ensuing debate has resulted in constantly changing forest management plans, appeals of plans, protests against timber sales, lawsuits, short-term legislation, convening of the cabinet-level Endangered Species Committee, and uncertainty in the timber industry about the continued availability of timber from federal lands.

At the same time there has been a continuing loss of northern spotted owls and their habitat, and planning for the owl has remained poorly coordinated. The northern spotted owl recovery plan provides a biologically sound method to recover the owl, remove the uncertainty about timber supply, and bring some stability to people who depend on the timber industry in this region.

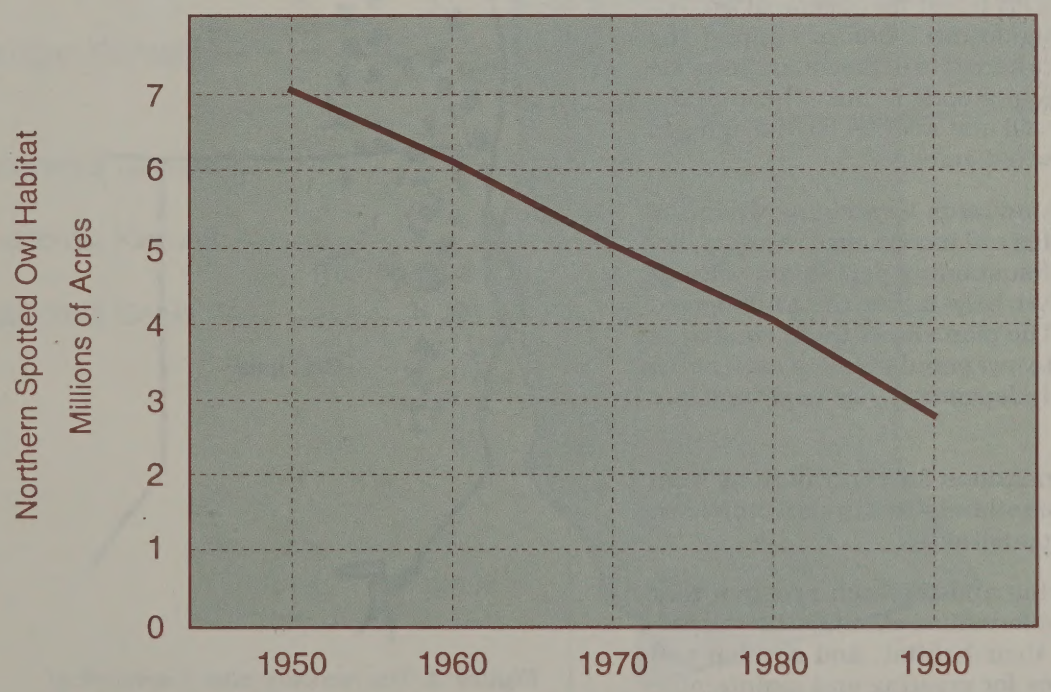


Figure 1: *This graph shows the trend in northern spotted owl habitat in the Oregon Coast Range and western Oregon Cascades provinces, illustrating why the bird is threatened. These two Oregon provinces were chosen for the illustration because data for all ownerships were available.*

What is the plan?

The *Northern Spotted Owl Recovery Plan*, developed by the 18-member Recovery Team, has seven key elements:

1. A network of 196 designated conservation areas (DCAs), each protecting enough habitat on federal forestlands to support a number of breeding pairs of owls. These areas are uniformly spaced in the western portions of Washington and Oregon, and in northwestern California, in a way that meets the owl's biological needs (see Figure 2). Approximately 7.5 million acres of federal land are included in DCAs, about 2.1 million acres of which are within wilderness areas or national parks.

2. Guidelines for forest management and other activities on federal lands in the DCAs, including prohibition of timber harvest in suitable owl habitat.

3. Guidelines for forest management on federal lands outside the DCAs to support the DCA network where it is deficient and provide dispersal habitat among DCAs. These guidelines initially will add about 410,000 acres to the total protected acreage.

4. A set of standards for judging when the northern spotted owl has reached recovery, defined as a self-sustaining population without need for further help under the Endangered Species Act. The plan allows these standards to be applied to owl populations in each of the 11 provinces independently or in groups (see Figure 3).

5. Recommendations for contributions from nonfederal forestlands to support northern spotted owl populations.

6. A monitoring and research program that will seek new information about northern spotted owls and their habitat, and develop and test techniques for creating and maintaining owl habitat while allowing appropriate forest management.

7. Mechanisms that implement the recovery plan, provide oversight and coordination, yet rely primarily on existing authorities and planning procedures.

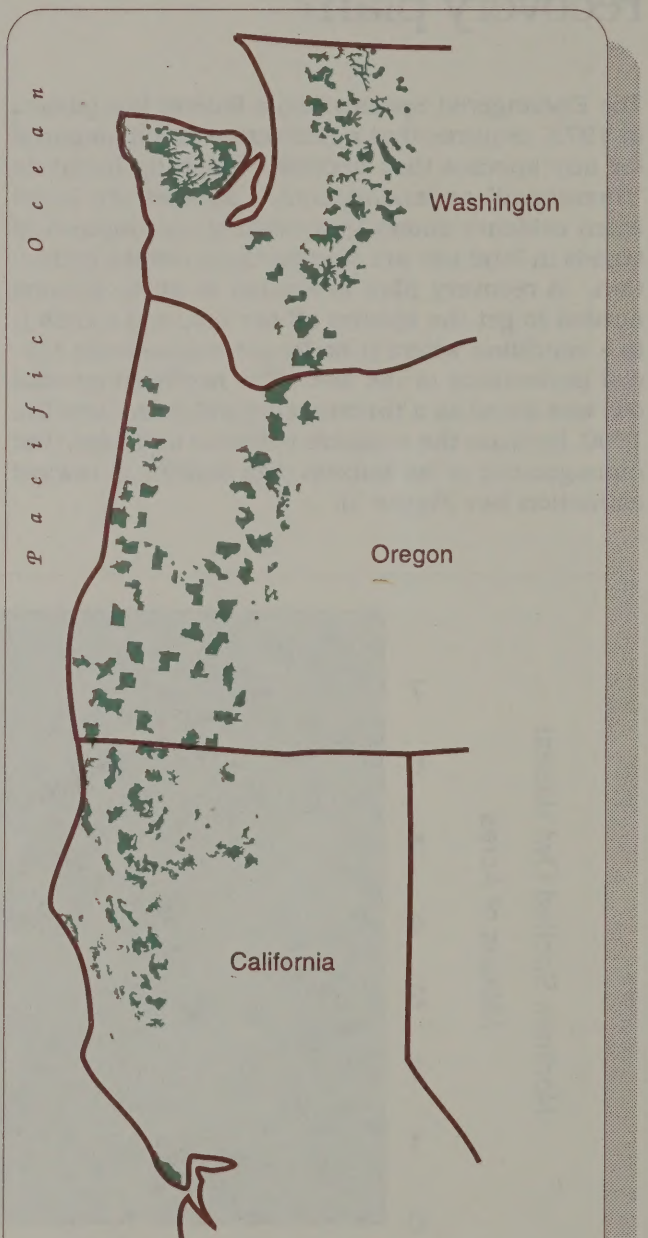


Figure 3. *The recovery plan's network of designated conservation areas (DCAs).*

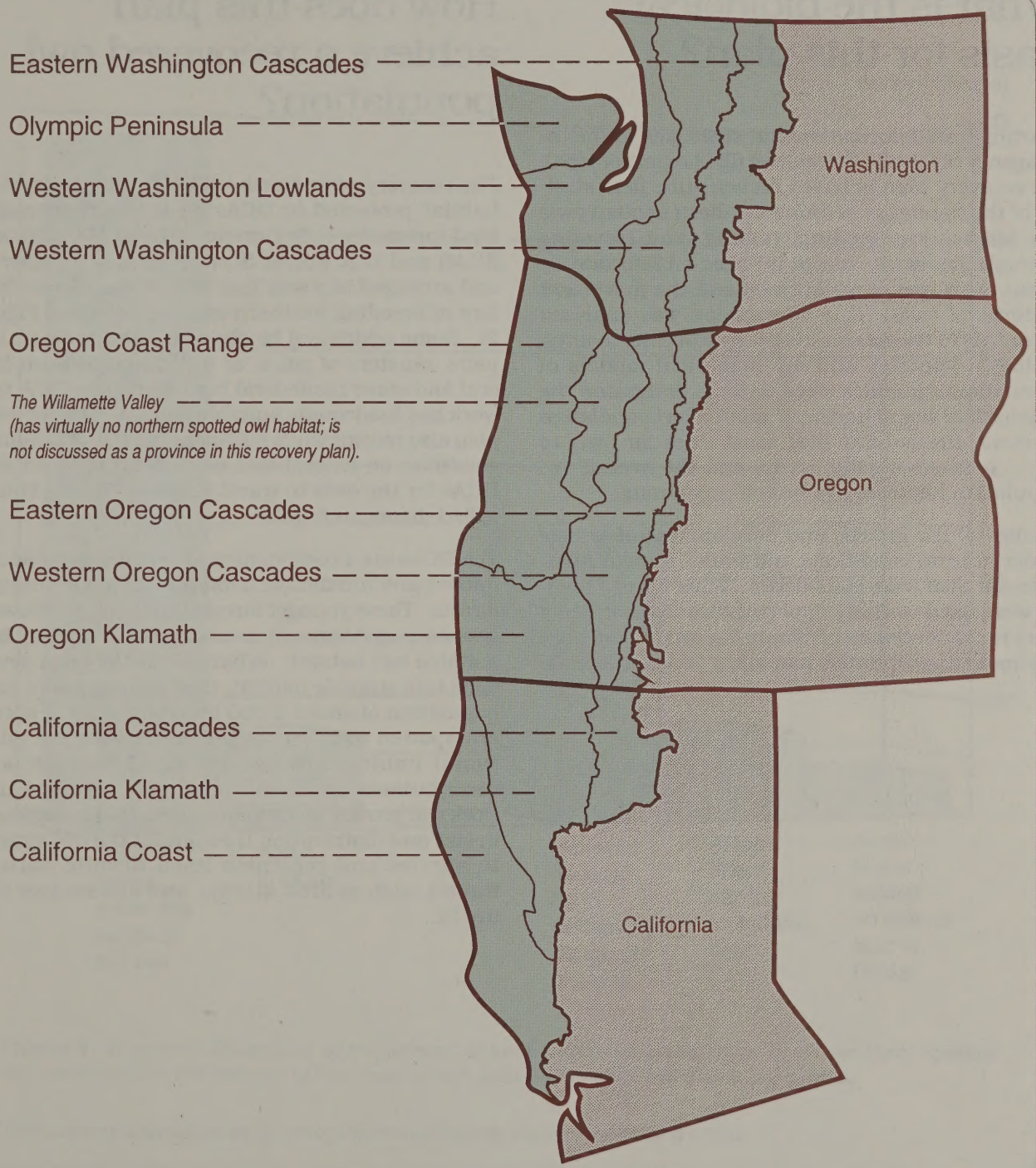


Figure 3. *Provinces within the range of the northern spotted owl in the United States.*

What is the biological basis for this plan?

Starting from information and strategies in the Interagency Scientific Committee (ISC) report of 1990, the recovery plan is based on scientific field studies of the habitat conditions northern spotted owls use for nesting, feeding, resting, and traveling through the forest. It also is based on information about birth and survival rates and the movement patterns of owls. This information was analyzed according to the scientific concepts of conservation biology. Theories and mathematical models of population dynamics were used to determine the appropriate size of northern spotted owl population clusters, the habitat that must exist for owls to travel between cluster areas, and the overall owl population necessary to be self-sustaining.

Studies of the growth and development of forests under natural conditions and under human management also were considered. Silvicultural models were used to study opportunities for promoting more rapid development of suitable owl habitat conditions by appropriately managing younger forests.

How does this plan achieve a recovered owl population?

The recovery plan starts with 7.5 million acres of habitat protected in DCAs on federally managed land (primarily U.S. Bureau of Land Management [BLM] and U.S. Forest Service land, see Figure 4) and arranged in a way that will support local clusters of breeding northern spotted owls (see Figure 2). Some additional blocks of habitat support owl pairs, clusters of pairs, or individual owls on federal and some nonfederal land where the DCA network has inadequate suitable habitat. The recovery plan also recommends sufficient habitat of adequate condition on federal and nonfederal land outside DCAs for the owls to travel between DCAs. This is called dispersal habitat.

The DCAs are a combination of existing suitable owl habitat and unsuitable habitat made up of younger forests. These younger forest stands will be allowed, or encouraged through management, to mature into suitable owl habitat. When the DCAs have developed into suitable habitat, they will support a total population of about 2,300 breeding pairs of northern spotted owls. In combination with the additional habitat blocks, dispersal habitat, and contributions from nonfederal land, this DCA network will provide an owl population that is sufficient in size and distribution throughout the owl's range to survive and replenish itself despite natural threats such as fires, storms, and disease (see Figure 3).

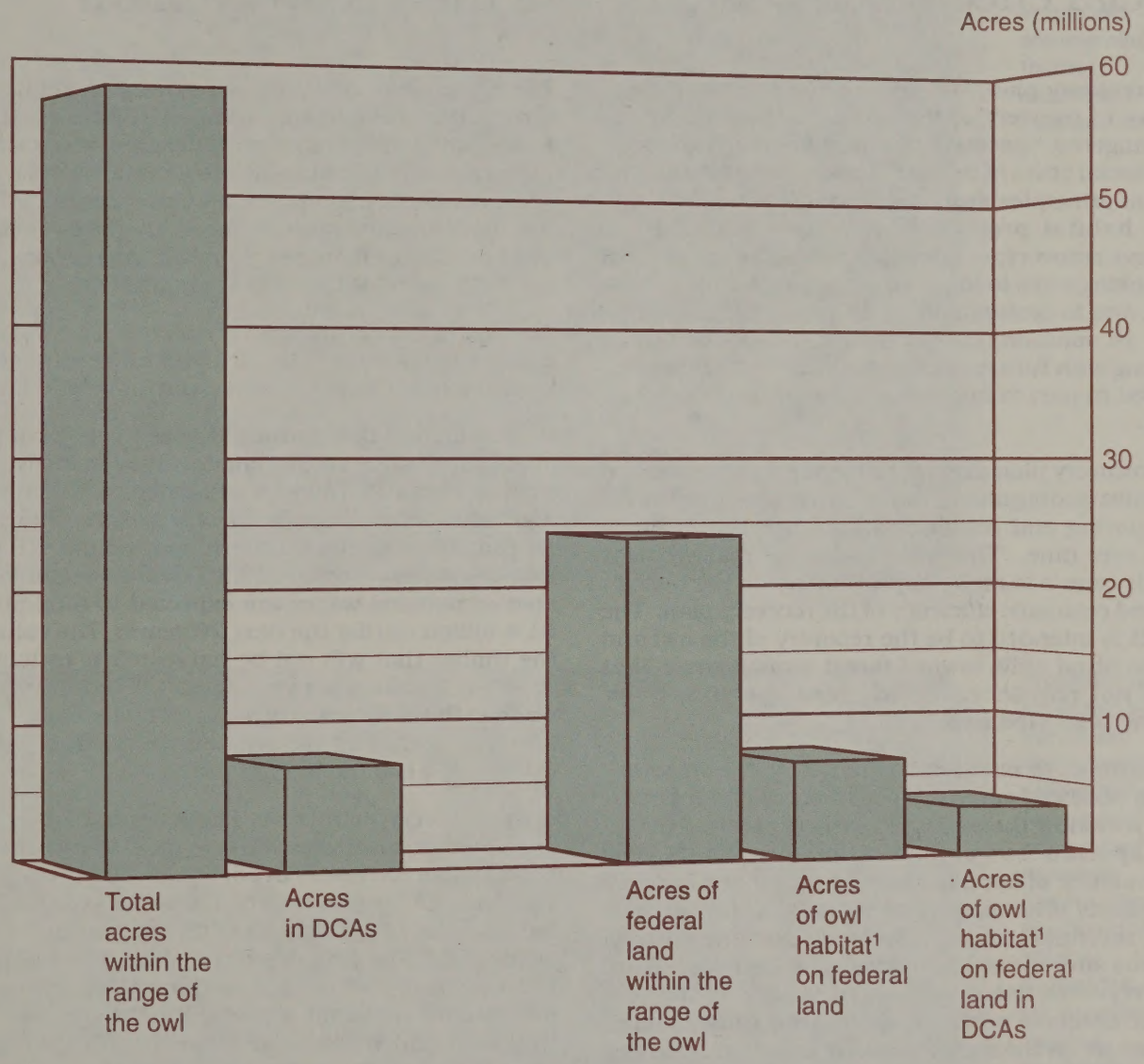


Figure 4. *A graphic illustration of the amount of land within the entire range of the northern spotted owl, compared to the amount of that land which falls into each of the above categories.*

[1]*Owl habitat* as used here refers to northern spotted owl nesting, roosting, and foraging habitat.

How were economic and social effects considered?

The recovery plan was designed to achieve the objective of recovery of the owl, as mandated by the Endangered Species Act, while keeping economic and social costs of recovery as low as possible. Biological principles and information were used to design habitat protection measures sufficient to achieve recovery; economic principles were applied in seeking ways to implement the protection at least cost, and to evaluate different approaches to recovery. In addition, the portion of the recovery plan dealing with future management experiments is intended in part to minimize economic and social effects.

The recovery plan also recommends a process called adaptive management, using an ongoing program of monitoring and research to improve the recovery plan over time. The goal of adaptive management in this case is to make improvements in the biological and economic efficiency of the recovery plan. The result is intended to be the recovery of the owl and an eventual shift toward forest management that does not require reserved areas specifically for northern spotted owls.

In addition to economic principles, the Recovery Team reviewed several types of economic information, including the estimated costs of previous northern spotted owl conservation proposals; the dependency of local economies on timber harvest; the effects of management actions on timber harvest, revenues, and employment; and the costs of various silvicultural practices. The Recovery Team also reviewed five major recent studies of the economic effects of northern spotted owl conservation. Literature on the social effects of economic changes in rural communities and research on timber-dependent communities also was reviewed by the Recovery Team.

What are the likely effects of this recovery plan?

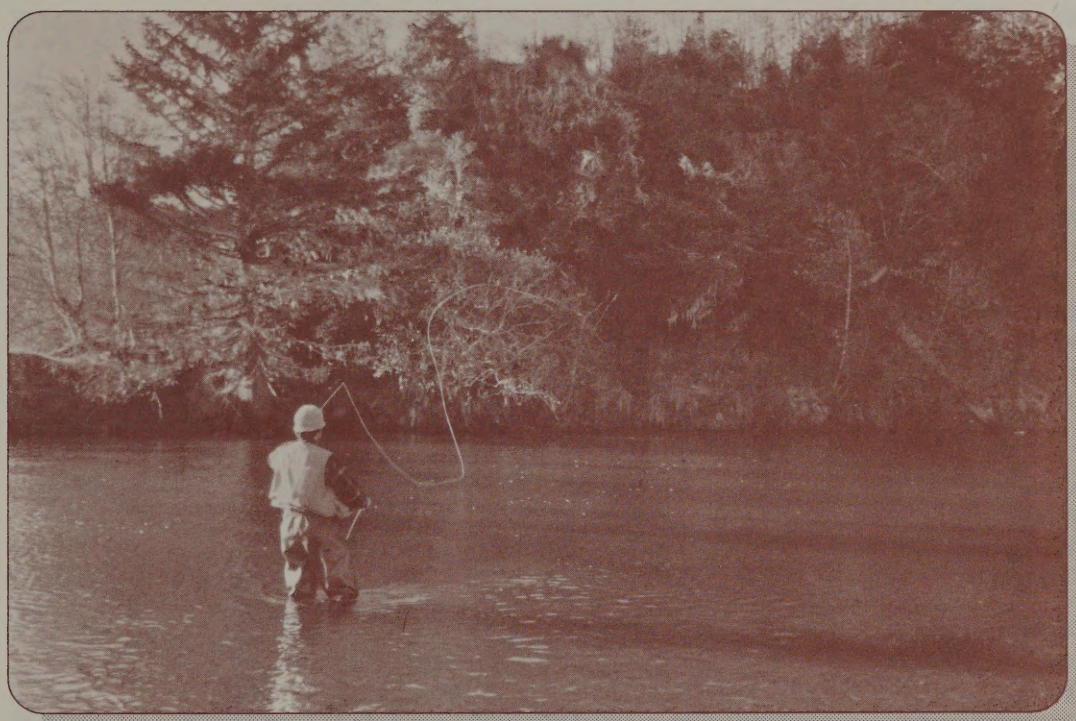
The objective of this plan is recovery of the northern spotted owl and conservation of its ecosystem. Maintaining this ecosystem will have some positive, but not easily measurable, economic effects. The positive effects include the potential continued existence of all other species that share the owl's habitat; benefits to fisheries, tourism, recreation, and aesthetics; and future forest productivity.

Another effect of this recovery plan will be the specific protection of habitat for about 53 percent of the known northern spotted owl pairs on federal lands.

It is estimated that putting this recovery plan into effect will reduce employment in the Pacific Northwest by about 32,100 jobs compared to the employment that would have been expected in 1995 with no protection of the northern spotted owl (18,900 timber industry jobs and 13,200 related sector jobs). Lost or reduced wages are expected to total about $1.4 billion during the next 20 years. The value of the timber that will not be harvested is estimated to be $470 million per year. This will reduce net income to the U.S Treasury by an estimated $328 million per year, and reduce county receipts by an estimated $100 million per year.

If the recovery plan is not implemented, other owl conservation measures will remain in effect and restrict timber harvests. In particular, the Forest Service and BLM are likely to continue the policies they have developed in response to the recommendations of the ISC. The Endangered Species Act will continue to prohibit federal actions that adversely modify critical habitat or jeopardize the species. The U.S. Fish and Wildlife Service (FWS) also will continue to enforce the prohibition against taking northern spotted owls, as defined by the Endangered Species Act, on lands of all ownerships.

In the absence of a coordinated plan, court challenges and administrative appeals could continue to be filed to block federal timber sales. Implementation of an approved recovery plan could provide an opportunity to remove some of the uncertainty that has added to economic disruption in this region, and contribute to greater stability in the timber industry.



Implementing the recovery plan will benefit sport and commercial fishing, aesthetics, and tourism.

Projected job reductions in the timber industry will affect timber fallers and other woods workers. Losses also are predicted in related industries such as suppliers of logging equipment.

An example of older forest which provides for all the habitat needs of the northern spotted owl, including broken-top and old dead trees with cavities for nesting; big live trees with plenty of branches to give shelter from temperature extremes and predators; smaller trees for the owl to sit on while watching for prey; dead or down trees for the prey to live in; and enough room between the upper and lower layers of branches for an owl with a four-foot wingspan to fly around.

This Unique Situation

Extensive Habitat

The nature of the northern spotted owl and the decline of its habitat combine to create a situation quite different from that addressed in most recovery plans. Most threatened or endangered species are found in relatively small, localized habitats. Protective measures for those species often involve a small land area, with relatively minor effects on economic activity.

In contrast, the northern spotted owl has existed in huge expanses of natural forest. The owls have lived sparsely distributed across the ecosystem, each pair often ranging over thousands of acres to find prey and nest sites. This historic habitat included most of the native forests of the western Pacific Northwest, encompassing large portions of three states (Washington, Oregon, and California) and several different kinds of forests.

Studies show that northern spotted owls today select mature or old-growth forests, and generally avoid young forests. But the once-extensive tracts of privately owned older forest in the Pacific Northwest were logged early in the region's history. Most timber harvest on public land also was in old forests. Eliminating the slow-growing old trees and replacing them with vigorous new plantations was thought to allow a higher sustainable rate of harvest. Long-term management was aimed at the highest possible sustainable levels of timber production, with some constraints for protection of other values as provided by laws and regulations.

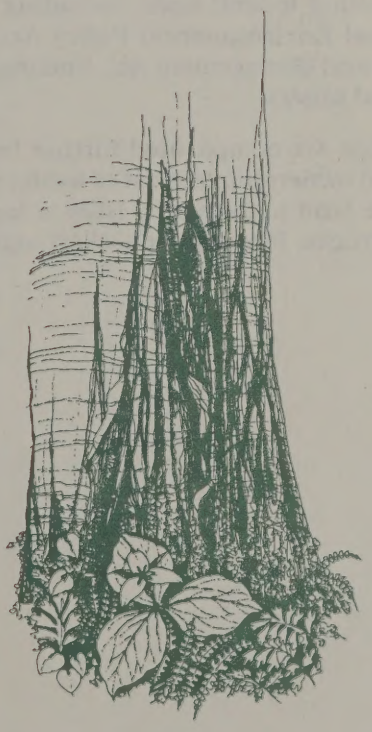
With few exceptions, timber harvest was done by clear-cutting. Clear-cut harvest patterns were driven by economics, science, ownership, and access, leading to checkerboard patterns of clear-cuts and trees in some areas, and very large clear-cuts in others.

This history has left the region with a relatively limited amount of the older forest which was most of the northern spotted owl's habitat. An article published in the October 1991 *Journal of Forestry* states that as little as 13.1 percent of historical old-growth forest (200 years old or older) may remain in western Oregon and western Washington. Also, the remaining acreage of older forest has continued to shrink rapidly. In recent years, as much as 70,000 acres of old-growth timber was clear-cut every year from federally managed land alone. Finally, the remaining older forest is highly fragmented, with many of the fragments widely isolated from one another.

Those factors (limited remaining older forest, rapid harvest of remaining older forest, and uneven distribution of remaining older forest) combine to threaten the existence of the ecosystem, and species like the northern spotted owl that are associated with it. Concern about the potential to conserve this ecosystem and its species is supported by a number of modern laws, including the Endangered Species Act of 1973. This law, as amended through 1988, says:

> *"The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved . . .."*

The recovery plan presents a unique opportunity to achieve recovery of the northern spotted owl, conservation of its ecosystem, benefits for other species, and a return to a more predictable, though reduced, flow of timber from federal forests.



Trillium *(T. ovatum).*

Multiple Ownerships and Regulation

Cooperation will be a vital part of successfully implementing the recovery plan, because of the challenging pattern of land ownership, land management responsibility, and regulation within the range of the northern spotted owl. Ownership of affected forestlands is divided among innumerable large and small corporate and individual owners, several Indian tribes, and a multitude of federal, state, and local government agencies.

Furthermore, the three state governments involved, the 50-odd counties, and the four federal land management agencies (BLM, Forest Service, National Park Service, and Bureau of Indian Affairs) have substantially different enabling legislation, missions, goals, and regulations.

For example, the BLM oversees more than 2¼ million acres of forestland in western Oregon, all within the historic range of the northern spotted owl. The BLM's actions are directed by a number of potentially conflicting federal laws, including the O&C Act, National Environmental Policy Act, Federal Land Policy and Management Act, Endangered Species Act, and others.

BLM's actions are complicated further by the patterns of land ownership in most of western Oregon. Much of the land managed by BLM is former railroad land grants, forming a checkerboard pattern in which the squares under BLM management adjoin those belonging to a variety of private owners.

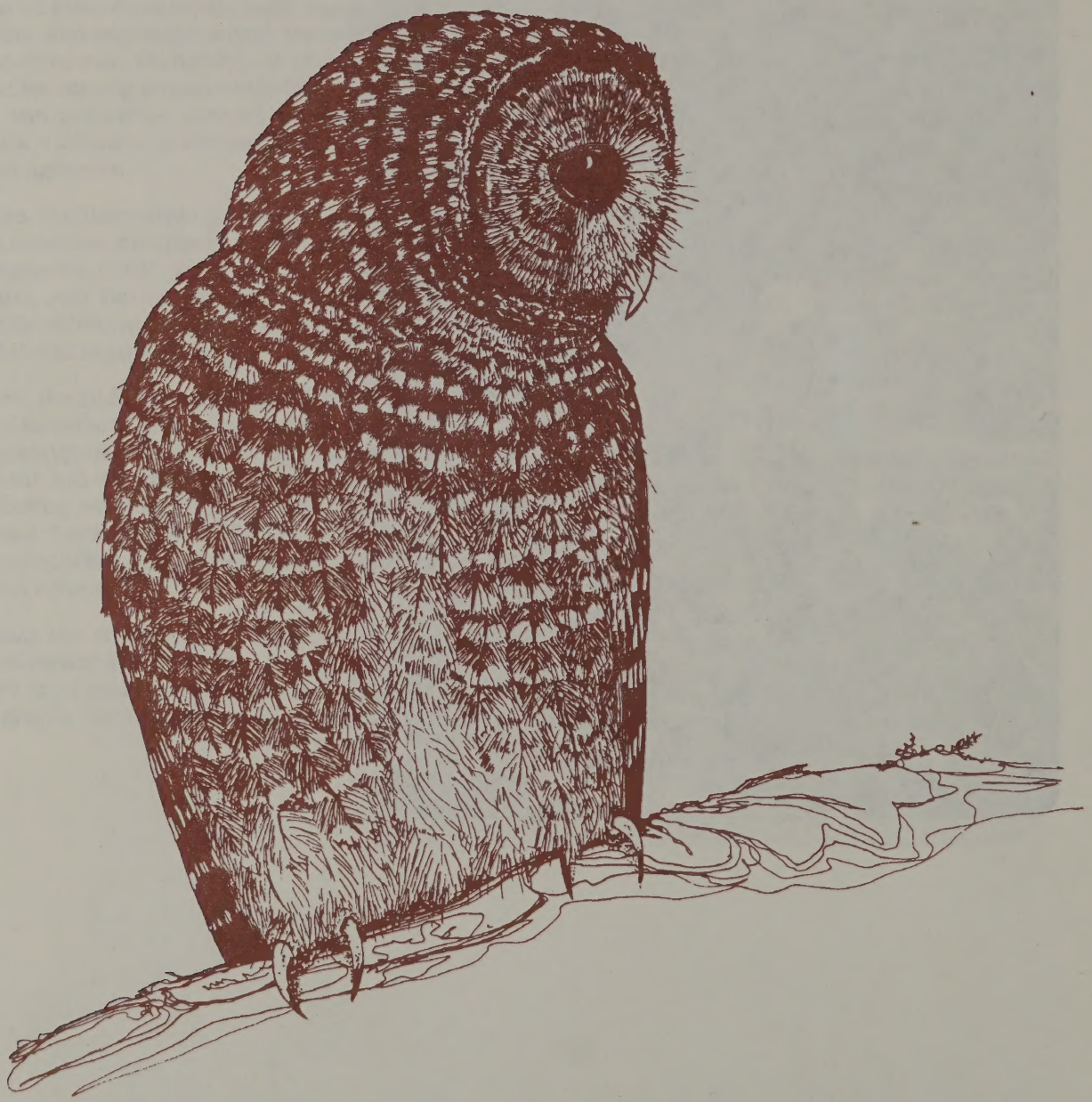
More than 19 million acres of national forests, managed by the Forest Service, also are within the northern spotted owl's range. This adds the National Forest Management Act and other laws to the legal authorities that must be dealt with. Though most of the national forest lands are in larger blocks than BLM lands, some are equally fragmented. In addition, broad areas of BLM land in western Oregon are mingled with the various national forests, and each national forest is managed under its own individual plan.

More than 2 million acres of National Park Service lands also falls within the northern spotted owl's range, but national parks are not managed for timber production, so any conflict with management for owl habitat is minimal. Indian lands are managed under the auspices of the Bureau of Indian Affairs, but are sovereign nations within the boundaries of the United States, and this situation raises other complex questions.

Other large blocks of northern spotted owl habitat in key areas, as well as smaller, scattered segments of habitat, are owned or managed by a wide variety of state and local governments, corporations, and individuals.

Implementation of the recovery plan must account for an agency's and state's legal abilities and restrictions, as well as the reality of applying a plan over an intermingled ownership. The recovery plan applies a systematic and coordinated approach to dealing with these complexities.

Some of the patchwork appearance of the landscape within the range of the northern spotted owl has been caused by the complexity of ownership patterns and the differences in land-use rules applied to different ownerships.



Adult northern spotted owl *(Strix occidentalis caurina)*.

Natural History

Introduction

The northern spotted owl (*Strix occidentalis caurina*) is one of the most studied and best known owls in the world. Three major management plans have been developed to protect the owl, and three reviews of its ecological status have been conducted by the FWS.

Northern spotted owls are medium sized owls, chocolate brown in color, with round to oval white spots on their body feathers and white bars on their tails. Other common distinguishing features are their dark eyes surrounded by tawny-colored facial disks.

Northern spotted owls are found from southern British Columbia, Canada, south to Marin County, California. They range eastward to the edge of the Palouse prairie in Washington and the Great Basin shrub steppe in Oregon and California. About 3,500 pairs of northern spotted owls are known to exist today. Although northern spotted owls have been sighted in almost all areas within their general range, their breeding distribution is restricted to forests. They are found from sea level to as high as 7,500 feet in the southern portion of their range, and to about 5,000 feet in the northern part of their range.

Spotted owls are active at night. They are "perch-and-pounce" predators, that is, they select a perch and wait until prey is detected, then pounce to capture it with their talons. They communicate by means of a variety of hoots, barks, and whistles.

Because spotted owl prey is patchy in distribution and variable in abundance, it is important for spotted owls to defend territories and use large areas for foraging.

Habitat

Northern spotted owls are known to nest, roost, and feed in a wide variety of habitat types and forest stand conditions throughout their range. Most observations of spotted owl habitat use have been made in old-growth and mature forests, but observations of spotted owls in previously logged stands are not uncommon. Studies show spotted owls select for mature or older forest stands and select against young forest stands.

Most northern spotted owl nest sites on public lands are located in older forests. Spotted owls are known to nest in some areas where uneven-aged silviculture has occurred or where fast tree growth in younger forests facilitates rapid habitat development, especially if residual large trees with old-growth characteristics are present. Several studies have been conducted on the structure of spotted owl nesting habitat. Studies that compared nest sites with available habitat suggested that the owls, in general, use forests with greater complexity and structure (that is, forests with several tree species, several sizes and ages of trees, containing both standing and down dead trees, and with open space among the lower branches).

Spotted owls do not build their own nests, they depend on naturally occurring nest sites. In older forests, owls tend to nest in broken-top trees and cavities. Platforms, like abandoned raptor nests and mistletoe brooms, are used less frequently. In forests younger than 150 years, nest sites are found more frequently in platforms.

During the summer, roosting sites are usually cool, shady spots near streams or on the lower third of slopes in relatively dense vegetation. Spotted owls respond to variation in temperature and exposure by moving within the canopy to stay in more favorable conditions. Multistoried forest stand structure, with tree branches more tightly spaced near the treetops and more open underneath, allows this movement.

Foraging (feeding) habitat appears to be the most variable habitat category. Nevertheless, northern spotted owl foraging habitat generally is similar to other habitats: canopy closure is high (60 percent or greater); the stands are multistoried with dominant trees 24 inches or more in diameter, and often of several age classes; and stands are a mixture of shade-tolerant conifers, hardwood trees, and large numbers of snags or down logs.

Old-growth forests are declining rapidly throughout the northern spotted owl's range as a result of logging. To the extent that northern spotted owls are dependent on these older forests, continued logging of their habitat will threaten extinction of the population. Although spotted owls have been reported occupying uneven-aged managed stands in northwestern California, eastern Oregon, and eastern Washington, forest structure used by spotted owls in these stands is similar to the structure of habitat used by spotted owls in old-growth and mature stands.

Owls in managed forests usually occupy areas with high structural diversity, and high canopy closure, with either large diameter or residual old trees. These stands are usually more than 60 years old and remain from partial logging in the past. The fast growth rate of redwood trees, presence of understory hardwood trees, and the remnant old trees within the stands facilitate rapid structural development in some coastal forests. Critical aspects yet to be estimated in more recently harvested forests are the survival, recruitment, dispersal, and reproductive patterns of spotted owls as compared to populations in older, more natural forests.

One of several northern spotted owls visited by the recovery team in 1991.

Home Range

Because of the initial observation that northern spotted owl home ranges were very large (averaging more than 2,000 acres), a great deal of scientific effort has been devoted to verifying the original observations and estimating variations in spotted owl home ranges. Some generalizations can be made about home range characteristics from these studies. First, all studies of home range size are consistent with the original observations of large northern spotted owl home ranges. Second, there is considerable geographic variation in home range size, with the spotted owls in Washington's Olympic Peninsula having the largest home ranges. Last, home range size appears to increase as habitat becomes more fragmented by logging.

One important feature of an owl's home range is the amount of suitable habitat within the boundaries of the home range. The ISC report summarized the amounts of old-growth and mature forests within spotted owl pair home ranges. From a number of studies, the median amount of these types of forest within the northern spotted owl's range was 615 to 4,579 acres. In only three studies were median amounts of these types of forest less than 1,000 acres.

Part of Oregon's Tillamook State Forest visited by the recovery team during one of its tours in the region.

Prey

Although northern spotted owls capture a broad array of mammals, birds, and insects as prey, they primarily eat small mammals. Woodrats and flying squirrels comprise the majority of their diet. One of these species usually dominates the owls' diet in an area, and this selection is related to habitat and the distribution of the preferred prey species.

Spotted owl prey availability is a possible reason for the occurrence of spotted owls in old-growth and mature forests. Northern flying squirrels are dependent on forests, but woodrats are not. Woodrats are more abundant in clear-cuts than they are in old-growth forests. Yet spotted owls apparently spend little time hunting in clear-cuts, possibly because the dense, brushy vegetation found in recent clear-cuts prevents spotted owls from capturing woodrats effectively. In more open older forests, spotted owls may be more effective predators even though woodrats are less abundant.

Nesting, Dispersal and Survivorship

Northern spotted owls normally lay only one or two eggs each year, and there is little variation in the number of eggs laid by a female. However, there is large variation in nesting success over time and among regions. Nesting success within a population can range from 0 to 100 percent.

The process of an animal leaving one area to establish a new home range in another area is called dispersal. Dispersal can be undertaken by juvenile or adult spotted owls. Scientists have used radio-telemetry to estimate patterns of juvenile dispersal. Juvenile owls disperse in September and October after they reach adult body mass. They apparently leave the areas where they were hatched in random directions, and travel relatively long distances (4 to 12 miles in recent studies in California, slightly farther in recent studies in Oregon) during the autumn of their first year of life. The pattern of dispersal varies from year to year in a variety of ways including differences in direction, distance, and survival.

Annual adult owl survival studies, from both banded birds and radio-marked birds, indicate that spotted owls are long-lived birds (living 17 to 20 years). In short-term studies, survival rates may vary drastically as spotted owls respond to varying environmental conditions. Studies of long-lived species must be of long duration to achieve reliable estimates of age-specific survival rates.

Population Projections

The number of northern spotted owls is a topic of much debate. With increasing survey and monitoring of populations, the number of known owls has increased greatly since the first estimates of total abundance were made. These observations of higher owl abundance reflect greater knowledge and effort expended to count owls, not increasing northern spotted owl populations.

Because spotted owls are relatively long-lived, the changing status of their populations is difficult to estimate. Mathematical models are used to project population trends using estimates of the vital rates, such as birth and death rates. Almost all modeling projections indicate that northern spotted owl populations are declining. Habitat loss appears to be strongly related to population declines.

Northern flying squirrel *(Glaucomys sabrinus).*

Summary

Knowledge of the natural and life history of the northern spotted owl has grown tremendously in the past 10 years, and more is known about this subspecies than about most threatened or endangered species in the world. There is enough preliminary information on the statistics of northern spotted owl populations to make initial population projections; something that cannot be done for many other species. However, because the owl is long-lived, estimates of the populations' rate of change may be modified as they are followed through time. It is evident that much more needs to be learned about the northern spotted owl and other old-growth dependent species to allow management plans compatible with their ecology.

A broad area of managed forest, with recent and older clearcuts mixed among various-age forests.

Endangered Species Act Listing

The Endangered Species Act assigns responsibility to the Secretary of the Interior to identify species at risk of extinction. Under this act the Secretary of the Interior has jurisdiction over terrestrial and freshwater species and is charged with determining whether any species is endangered or threatened. This responsibility usually is delegated to the director of the FWS.

It is important to understand three definitions used in the Endangered Species Act.

- "Species" includes any species or subspecies of fish, wildlife, or plants, and any distinct population segment of any species of vertebrate fish or wildlife that interbreeds when mature.
- "Endangered" species means any species that is in danger of extinction throughout all or a significant portion of its range.
- "Threatened" species means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Under these definitions, the northern spotted owl subspecies was treated as a species and was listed as threatened. A biological evaluation by the FWS determined that northern spotted owl populations were likely to decline until the owl became endangered, if conditions and trends at the time of listing did not change. When evidence of such a situation is available, the director of the FWS must list the species.

Decisions on the listing of a species are required by the law to be based only on the best scientific and commercial information available. The only commercial information which can be considered is that about harmful trade in the species or products derived from it; the law specifically prohibits any consideration of economic consequences while deciding whether a species should be listed. To determine whether to propose and list the northern spotted owl as threatened, special panels of scientists reviewed the owl's status.

The law allows anyone to petition the FWS to add a species to, or remove a species from, the lists of threatened and endangered species. Within 90 days of receiving a petition, the FWS must decide whether substantial information has been presented. If that 90-day decision is positive, the FWS must decide whether listing is warranted within one year of the date the petition was received. If the listing is warranted, the FWS must begin the process to list the species.

A proposed rule that describes the listing and explains the reasons for it must be published in the *Federal Register*, the daily journal of federal government activities. Within a year of the proposed rule the FWS must either adopt a final rule or withdraw the proposal if it proves not to be warranted. If scientific experts disagree on the evidence, up to 6 more months can be taken to reach a final decision. The proposed rule to list the northern spotted owl as a threatened species was published on June 23, 1989; the final rule was published on June 26, 1990, and took effect on July 23, 1990.

Key Strategic Concepts

In a letter to the Recovery Team, Secretary of the Interior Manuel Lujan Jr. directed the team to prepare a recovery plan for the northern spotted owl with consideration of a number of factors. These became the six strategic principles upon which the recovery plan is based.

1. Recognizing the "biological imperative" of the Endangered Species Act, the plan must provide adequate assurance that recovery would be achieved.

2. The plan, while meeting the requirement of achieving recovery, must make an intensive effort to minimize social and economic costs, and attempt to distribute such costs equitably across the region.

3. The plan must be comprehensive, guiding future federal, state, and private activities affecting the owl, including monitoring, research, habitat protection, development of conservation plans, and other efforts.

4. The plan must recognize all contributions to recovery. If contributions from some areas exceed the plan's recommendations, they may reduce requirements in other areas and help minimize the cost of recovery. Providing incentives for nonfederal landowners to find owls and protect them through management plans may be useful to enhance recovery.

5. The plan must consider its effects on other threatened and endangered species, and those species that might be listed in the future, to reduce the long-term costs of protecting species in these ecosystems.

6. The plan must be responsive to new information and use it to seek more efficient ways to achieve recovery.

Vanilla leaf *(Achlys triphylla).*

Key Biological Concepts

The measures adopted in this recovery plan reflect general biological principles as well as the best and most recent specific knowledge about the biology of the northern spotted owl. The recovery plan builds on the concepts and information presented in the strategy developed by the ISC. The broad principles involved include:

- Larger populations are more secure than smaller ones.
- Populations close enough together to allow dispersal among them are more effective than are isolated populations.
- Connected habitat is more valuable to a species than fragmented habitat.
- Maintenance of a species throughout its range is more effective and less risky than maintenance in only a part of the range.

These biological principles led to recommendations for a network of DCAs on federal land. Management recommendations for DCAs are intended to maintain and increase habitat suitability for spotted owls. Recommendations for forests connecting DCAs are intended to allow owls to move from one DCA to another and support breeding pairs of spotted owls in areas where the DCA network is deficient.

The size and arrangement of DCAs are based on the best current information regarding the size of territories of breeding pairs of spotted owls and the ability of juveniles to disperse. Knowledge of habitat characteristics suitable to support the various life functions of owls has provided a basis for recommending management of forestlands that will lead to recovery. Organization of the recovery plan around the concept of multipair habitat areas is necessary for this species because its normal behavior includes significant interaction between owl pairs.

Information derived from the monitoring and research program eventually may result in significant changes in the Recovery Team's recommendations. The team has a long-term goal to move from a network of protected areas connected by managed forest, toward a landscape where conditions provide a more continuous distribution of owls. Results from monitoring and research may support such a change.

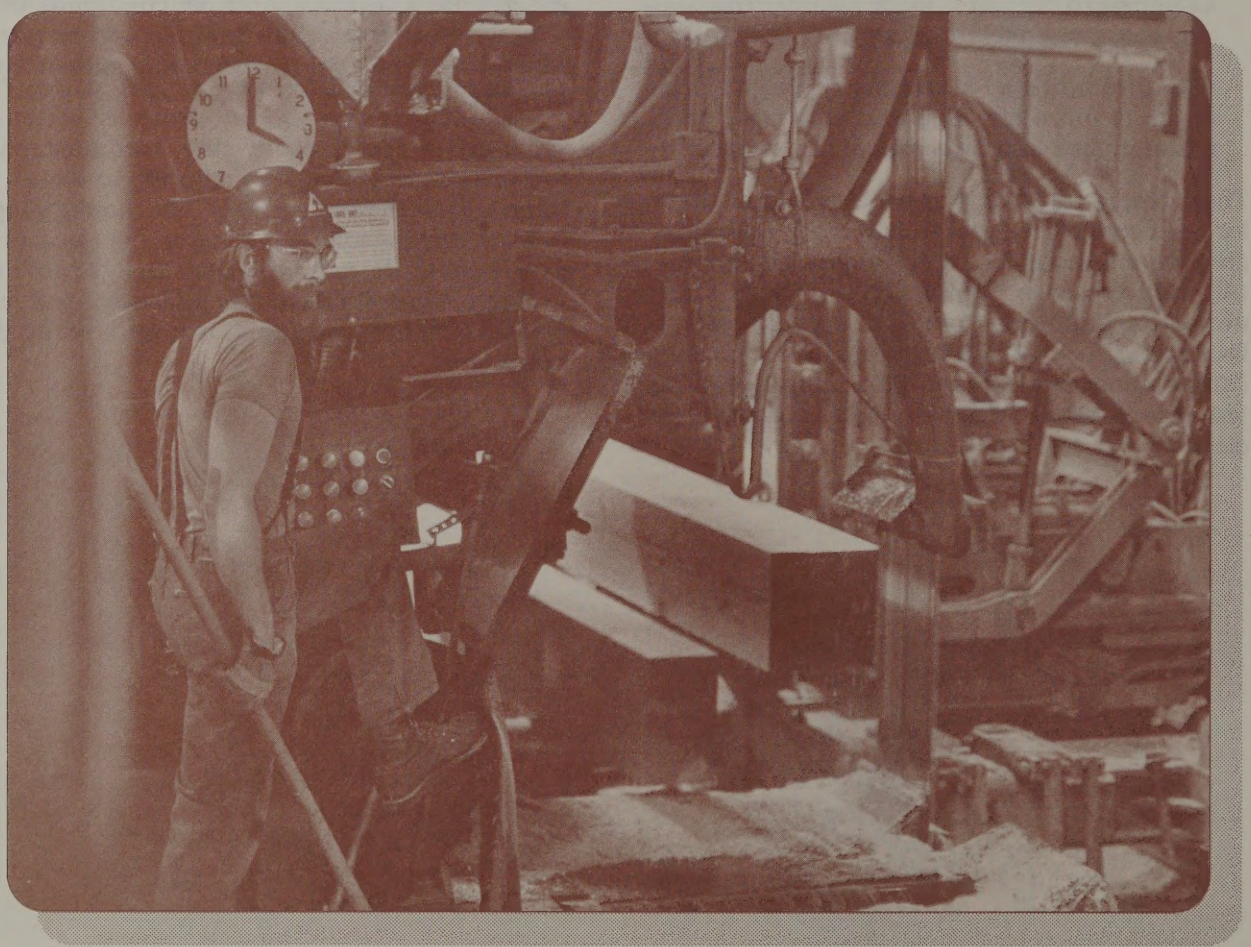
Throughout the recovery plan, recommendations are tailored to information specific to the 11 provinces within the owl's range. The plan attempts to tailor recommended conservation actions to local conditions in the belief that sensitivity to differences in habitat condition and management will lead to greater effectiveness and, it is hoped, reduced economic cost.

Key Economic Concepts

The Recovery Team's directive from the Secretary of the Interior stated that the recovery plan should address economic and social impacts "to the extent consistent with its legal mandate." This directed the Recovery Team to look for ways to reduce economic and social cost while achieving recovery, not to determine whether or to what extent recovery should be pursued. The Recovery Team attempted to minimize economic costs in ways that did not jeopardize the biological adequacy of the plan.

In searching for ways to reduce the cost of recovery, the Recovery Team recognized the importance of timber harvest as a source of personal and public income. People employed in the timber and wood products industries earn their income by supplying lumber and wood products to consumers. Federal, state, and some local governments derive income from the sale of timber from public lands. Federal timber receipts are shared with state and local governments. Income tax and other tax revenues also are related to timber harvest.

The primary economic cost of the recovery plan will be the income lost because timber harvest is restricted to protect owl habitat. Protection of enough habitat to support a self-sustaining owl population will be costly where high-quality habitat contains high-value timber, and in localized areas where timber harvest is the only source of income.



It is estimated that there will be thousands fewer jobs available in the timber industry, in places like this sawmill, compared to what might have existed if the northern spotted owl was not protected at all.

The Recovery Team's efforts to minimize the cost of achieving recovery were based on the principle that the quality of northern spotted owl habitat and its ability to produce owls are closely related. The cost of recovery can be reduced by searching for: 1) ways to provide owl habitat with the least possible restriction on timber harvest; 2) ways to make areas reserved for owl habitat more productive for owls.

The Recovery Team paid particular attention to opportunities to reduce the cost of recovery by:

- Seeking measures that directly increase the productivity of DCAs by accelerating the development of younger forests into suitable owl habitat. This also may provide some timber harvest.

- Using forestland of lower timber productivity to provide as much as possible of the necessary owl habitat.

- Locating DCAs in existing reserved areas, such as wilderness areas, wherever possible.

- Preserving or developing owl habitat areas that also contribute to the conservation of other species requiring protection.

The first economic benefit of the recovery plan may be to improve the predictability of the timber supply situation in the region, once the plan is adopted. Since this and the other positive economic effects of the recovery plan are difficult to measure and express in simple dollar figures, they are not included in this analysis. Positive effects also may include benefits to fisheries, tourism, recreation, and future productivity of the forest.

Woods workers are one of the groups in the timber industry which will be directly affected by conservation measures enacted to protect and recover the northern spotted owl.

Reduced timber harvests caused by northern spotted owl conservation measures will affect employment among reforestation workers, as well as those who harvest or process timber.

A Summary of the Recovery Plan

Introduction

The objective of the recovery plan is to recover the northern spotted owl by reducing existing threats so it can be removed from the list of threatened species. To accomplish this, the plan establishes four general criteria that must be met.

1. Northern spotted owl populations and habitat must be monitored with a scientifically credible plan.

2. The population of northern spotted owls must be stable or increasing in the province or provinces being considered for delisting.

3. Commitments from landowners and land managers must be in place to provide long-term protection of owl habitat.

4. Information from a variety of sources must indicate that the population of northern spotted owls will not need renewed protection under the Endangered Species Act.

The means to achieve this objective are:

- 196 designated conservation areas (DCAs) of appropriate size and spacing.

- Management guidelines for the 7.5 million acres of federal lands within DCAs.

- Management guidelines for the federal land outside DCAs.

- Recommendations for contributions from nonfederal land.

- Monitoring, research, and implementation plans.

Within the recovery plan, comprehensive sets of goals and strategies are established for each of 11 provinces, as shown in Figure 3. The physical and biological situations differ among these provinces, so recovery recommendations are specific to each of them.

Designated Conservation Areas (DCAs)

The designated conservation areas (DCAs) are intended to provide northern spotted owl habitat in relatively large blocks where clusters of breeding pairs of spotted owls will be able to live, reproduce, and interact over time. These DCAs are arranged in a network derived from the ISC report. The ISC's network (called habitat conservation areas, or HCAs) was based on biological principles, observed evidence, and computer-simulated population modeling. Each HCA was refined in size, shape, and location, seeking the best possible combination of habitat, known owls, and HCA shape. HCAs were to be a maximum of 12 miles apart (for the larger category 1 HCAs, 7 miles apart for the smaller category 2 HCAs) and as nearly round in shape as possible. The DCA network of the recovery plan is a modified version of the HCA network. Updated inventories of owls, owl habitat, and other species were considered in an effort to improve the biological and economic efficiency of the DCA network.

Management Within DCAs

The recovery plan contains general guidelines for management on federal lands within DCAs. The plan recommends that there be no timber harvest allowed in suitable habitat inside DCAs. Silvicultural activities like thinning will be used to promote development of suitable habitat for northern spotted owls, but only where studies indicate that development of owl habitat could be accelerated significantly. The guidelines recommend that silvicultural practices be limited to no more than 5 percent of any DCA within the first 5 years of carrying out the recovery plan. Such activities would be used in stands that are even-aged, have an average tree diameter of 11 inches or less, and have not developed a multilayered canopy (such as stands that have been clear-cut and replanted).

Salvage of dead trees within a DCA following a major fire, wind storm, insect infestation, or disease may take place under the recovery plan, but only where it would have a neutral or beneficial effect on owl habitat. Salvage would be allowed only in damaged areas larger than 10 acres and where canopy closure is less than 40 percent. Retention of live trees, some standing dead trees, and dead trees on the forest floor in these areas is required.

These general management activities outlined in the recovery plan are intended to be carried out under a comprehensive plan written for each DCA by the appropriate federal land management agency. Plans are to be written by teams including biologists, silviculturists, and others, and should describe management and monitoring that will take place in the DCA.

DCA management plans also should address the following:

- Unnecessary roads should be closed; roads that must be routed through DCAs for access to nonfederal land should be designed for the least possible impact to spotted owls and their habitat; no roads should be built in suitable owl habitat where reasonable alternatives exist.

- Firewood gathering should be restricted so that it does not interfere with the development and maintenance of owl habitat.

- Wildfire suppression and prevention plans should emphasize maintaining habitat within the DCA.

- Collection of minor forest products, such as ferns, Christmas trees, and mushrooms, generally should be allowed.

- Recreation, like hiking and hunting, generally should be allowed.

- Proposed research activities must comply with DCA management guidelines.

- Existing and proposed easements, contracted rights, and rights-of-way should be evaluated and revised where possible.

- Mining, construction, trail development, habitat improvement projects, land exchanges, construction of range facilities, and all other proposed activities and development should be examined for adverse effects on owl habitat and modified accordingly.

The recovery plan recommends that all federal land within DCAs be designated as critical habitat by the FWS, except for wilderness areas and national parks, which already are protected by law.

Management on Federal Land Outside DCAs

In the recovery plan, land within the range of the northern spotted owl but outside DCAs is referred to as the forest matrix. To support recovery of the owl from its threatened status, federal land in the forest matrix must do three things:

1. Provide habitat for spotted owls to move between DCAs. This is achieved by a 50-11-40 rule like that described by the ISC: within every quarter-township, at least **50** percent of the forest managed by each federal agency outside DCAs should provide stands of trees that average at least **11** inches in diameter and have at least **40** percent canopy closure.

2. Maintain reproductive owl pairs in areas where DCAs do not yet provide enough owls or habitat to function as intended. These are areas of habitat around the nest sites or activity centers of existing pairs of owls outside DCAs, and include enough nesting, foraging, and roosting habitat to support a pair of owls. They are called reserved pair areas, and criteria appropriate for each province were used to determine where, and how large, they should be.

3. Protect against the threat of large-scale natural threats or disturbances. In the eastern Washington Cascades, there is high likelihood of this due to fire and insect outbreaks. These disturbances pose a significant threat to the sparse spotted owl population in that area. To reduce the risk, it is recommended that habitat be provided for additional owl pairs and territorial single owls outside of DCAs. These are termed managed pair areas because it is recommended that habitat for these owl pairs be sustained by management that also will reduce fire and insect risk.

In addition, it is recommended that small areas, termed residual habitat areas, be maintained around existing owl pairs and territorial single owls. These residual habitat areas will help maintain options to provide for northern spotted owls throughout the landscape in the future, and their numbers will vary by province.

Nonfederal Land

Federal land and agencies have the major role in recovering the northern spotted owl because the owls are concentrated on federally managed land. Nonfederal land, however, is important to recovery of the owl and the recovery plan contains objectives for it. Nonfederal land is particularly important in parts of the owl's range where federal land makes up a minor part of the landscape.

Some of the tools that may allow nonfederal land to contribute to recovery include:

- Existing reserves such as parks and conservation easements.
- Voluntary private actions such as habitat conservation plans with commitments to long-term maintenance of suitable habitat.
- State forest practices laws and regulations.
- The Endangered Species Act prohibition on "taking" listed species.
- Purchase or land exchange to place selected habitat under federal management.
- Exchange of timber cutting rights, without changing land ownership.
- Conservation easements, mitigation banks, purchase or transfer of harvest or development rights.

Flightless ground beetle
(Cychrus tuberculatus).

Implementation

It is recommended that federal agencies adopt the recovery plan within about 7 months after the final recovery plan is approved. It will take about 5 years to fully phase in active compliance with all portions of the recovery plan. During that time, agencies will continue with policies and plans in effect that are consistent with the recovery plan, and begin the necessary steps to change their other management plans. If agency actions are not consistent with the recovery plan for an extended period, the recovery plan will have to be reevaluated because reductions in northern spotted owl populations and habitat may occur.

It is suggested that the affected states (California, Oregon, and Washington) review the recovery plan, begin to implement its recommendations under current authorities, and initiate other actions (such as habitat conservation plans with private landowners) as appropriate.

The FWS should modify its designation of critical habitat for the northern spotted owl to reflect recovery plan recommendations, use recovery plan recommendations as guidance in section 7 consultations under the Endangered Species Act, and prepare for a continuing review of recovery plan progress.

Once the final recovery plan is approved, the Recovery Team will remain in existence temporarily to provide advice and assistance to federal agencies, the states, private landowners, and industry. The recovery plan recommends that a coordinating group be created to provide long-term guidance. The coordinating group is envisioned to have no regulatory function.

Monitoring and Research

The objective of the recovery plan is delisting the northern spotted owl (removing it from the list of threatened species) throughout its range. Monitoring and research will provide information needed to support delisting decisions. However, during the years before delisting, monitoring and research will be vital to improving the recovery plan. This process is called adaptive management, and its goal in this case is to make improvements in the biological and economic efficiency of the recovery plan while maintaining or increasing the level of protection for the owl. Eventually, the result is intended to be the recovery of the owl and a shift toward management which does not require reserved areas.

Several questions are to be addressed using this approach. They can be divided into three areas, shown here with examples in each area.

Implementation - Was management direction actually implemented as specified in the recovery plan?

- Are DCAs being established as recommended by the recovery plan?
- Are matrix management guidelines being followed?

Effectiveness - Did the actions have the effects that were projected in the recovery plan?

- Are owl populations inside the DCAs stable or increasing?
- Are activities in DCAs producing the predicted forest structure over time?
- Are owls moving between DCAs?

Validation monitoring and research - Are the critical assumptions used in forming the recovery plan correct?

- How do individual owls and owl populations respond to forest management practices and resulting stand conditions?
- How well do various habitats provide for dispersal of owls?
- How do economic incentive systems operate to encourage landowner contribution to recovery?

Del Norte Salamander *(Plethadon elongatus).*

Members of the Northern Spotted Owl Recovery Team watch a male northern spotted owl take food to its mate in an old-growth cedar stand in Washington's Olympic National Park.

The Recovery Team has met monthly since March 1991, either in this Portland, Oregon, U.S. Fish and Wildlife Service office or one of a number of tour locations. Smaller committees of members also met frequently throughout the year.

What is the Recovery Team, and what did it do?

The Recovery Team

The Recovery Team is made up of 18 members appointed by Secretary of the Interior Manuel Lujan Jr. Members include biologists, ecologists, foresters, economists, federal forest and wildlife managers, and representatives of the governors of the three affected states.

Secretary Lujan directed the Recovery Team to develop a recovery plan for the northern spotted owl, giving appropriate consideration to the needs of other species and economic effects.

The Recovery Team began its work in March 1991. It held numerous meetings, as a team and in smaller committees working on specific matters such as consideration of other species, potential economic and social effects, current management and regulations, silviculture, and other topics. Members visited a wide variety of northern spotted owl habitats and forests in the three states, including lands in the Mt. Hood, Willamette, and Six Rivers National Forests, Olympic National Park, the BLM Eugene District, the Yakima Indian Reservation, Oregon's Tillamook State Forest, and Washington state forests. They also toured privately owned commercial forests including Fruit Growers Timber Company, Sierra Pacific, Weyerhaeuser, Willamette Industries, and the mixed ownership National Council for Air and Stream Improvement (NCASI) study area.

Beginning with information compiled by the ISC, the Recovery Team sought new information on northern spotted owls from a variety of sources and commissioned special reviews on topics such as silvicultural practices and management of threats from fire, insects, and disease. An automated geographical information system was developed to manage the great array of data on owl sites, habitat areas, and timber resources.

Public Involvement

The public has several opportunities to become involved in the federal listing process. First, anyone may petition the Fish and Wildlife Service to add a species to, or delete one from, the threatened or endangered lists. Second, opportunity for public comment is provided in connection with any proposal to change the lists, and comments must be considered in reaching a final decision. Comments may be submitted in writing or be delivered orally at public hearings. More than 20,000 comments were received in response to the proposal to list the northern spotted owl as threatened, including statements delivered at four public hearings.

Early in the recovery planning process, most of each week-long Recovery Team meeting was held in open session, attended by representatives of various interest groups, elected officials, news media representatives, and the general public. During the planning process, the Recovery Team sent summaries of past meetings and agendas of future meetings to a mailing list of nearly 400 persons, including the news media and local, state, and federal elected officials. Also, two letters requesting specific new information about northern spotted owls were sent to the same mailing list. A number of people, representing various interests, presented information or points of view to the Recovery Team or one of its committees. Periodic briefings were held for elected officials and agency staff.

After the draft recovery plan is released, there will be a 45-day public comment period. During this time there will be several public meetings, all of which will be announced in the regional news media. A summary of comments received and responses to their content will be included in the final recovery plan.

The public will have another opportunity to consider and comment on measures in the recovery plan before they are implemented by the individual land management agencies. The National Environmental Policy Act requires agencies to follow a process of evaluating alternatives, environmental effects, and public comments before adopting any new or changed land use practices, such as the requirements of this recovery plan.

Recovery Team Members

Donald R. Knowles - *Secretary's representative and team coordinator* - Associate Deputy Secretary, U.S. Department of the Interior, Washington, D.C.

Marvin Plenert - *Team leader* - Regional Director, U.S. Fish and Wildlife Service Pacific Region (Washington, Oregon, California, Idaho, Nevada, Hawaii, and the Pacific Trust Territories), Portland, Oregon.

Jonathan Bart - *Chairman* - Assistant Leader of the Ohio Cooperative Fish and Wildlife Research Unit; Associate professor, Department of Zoology at Ohio State University, Columbus, Ohio.

Robert G. Anthony - Assistant Unit Leader and Professor of Wildlife Ecology, Oregon Cooperative Wildlife Research Unit, Oregon State University, Corvallis, Oregon.

Melvin Berg - Chief, Division of Forestry, U.S. Bureau of Land Management, Washington, D.C.

John H. Beuter - Deputy Assistant Secretary of Agriculture for Natural Resources and Environment, Washington, D.C.

Wayne Elmore - U.S. Bureau of Land Management State Riparian Specialist for Oregon and Washington, Prineville, Oregon.

John Fay - General Biologist, Division of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C.

R. J. Gutiérrez - Professor, Department of Wildlife, Humboldt State University, Arcata, California. Current major studies ongoing in habitat, dispersal, genetics, and population dynamics of the spotted owl.

H. Theodore Heintz, Jr. - Assistant Director for Economic Analysis, Office of Policy Analysis, Department of the Interior, Washington, D.C.

Richard S. Holthausen - National Wildlife Ecologist, U.S. Forest Service, Logan, Utah.

Kenneth Lathrop - Supervisory Forester, Forest Products and Sale Administration, U.S. Bureau of Indian Affairs, Portland, Oregon.

Kent Mays - Program Manager for Spotted Owl Research, Development and Application program involving 24 national forests and two forest and range experiment stations, Portland, Oregon.

The recovery team toured the Yakima Indian tribe's managed forest, which has northern spotted owls nesting in it.

Richard Nafziger - *Representing the Governor of the State of Washington* - Special Assistant to the Governor for Timber Policy and Rural Development and Coordinator of Interagency Task Force on Timber Community Development, Olympia, Washington.

Martha Pagel - *Representing the Governor of the State of Oregon* - Governor's Senior Policy Advisor on Natural Resources, Salem, Oregon.

Christine Sproul - *Representing the Governor of the State of California* - Assistant Secretary, Legal Affairs, The Resources Agency of California, Sacramento, California.

Edward E. Starkey - Research Biologist and Terrestrial Ecology Program Leader, National Park Service Cooperative Park Studies Unit, Oregon State University; Professor of Terrestrial Ecology, Departments of Forest Resources and Fisheries and Wildlife, Oregon State University, Corvallis, Oregon.

John C. Tappeiner - Professor of Forestry at Oregon State University, Corvallis, Oregon, teaching silviculture and forest ecology, research in shrub and hardwood ecology, and vegetation management and forest stand growth.

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The recovery team toured a number or state and privately managed forests, one shown here is in northwestern Oregon.

Figure of "Saikomal," Cedar Man, from Haida totem.

Glossary

activity center - an area of concentrated activity of either a pair of northern spotted owls or a territorial single owl.

adaptive management - the process of implementing policy decisions as scientifically driven management experiments that test predictions and assumptions in management plans, and using the resulting information to improve the plans.

BLM - Bureau of Land Management, U.S. Department of the Interior.

canopy - a layer of foliage in a forest stand. This most often refers to the uppermost layer of foliage, but it can be used to describe lower layers in a multicanopy stand.

canopy closure - the degree to which the crowns of trees are nearing general contact with one another. Generally measured as the percent of the ground surface that would be covered by a vertical projection of foliage in the crowns of trees.

clear-cut - a common method of timber harvest in western Oregon, western Washington, and northwestern California which results in all the trees in the harvested unit being cut within a few weeks or months.

consultation (as in the Endangered Species Act) - a formal interaction between the U.S. Fish and Wildlife Service and another federal agency when it is determined that the agency's action may affect a species that has been listed as threatened or endangered or its critical habitat.

conservation (as in the Endangered Species Act) - the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided under the Endangered Species Act are no longer necessary.

critical habitat (as in the Endangered Species Act) - specific areas within the geographical area occupied by a species on which are found those physical or biological features essential to conservation of the species.

DCA - a contiguous block of habitat to be managed and conserved primarily for breeding pairs of northern spotted owls, connectivity, and distribution of owls; application may vary throughout the range according to local conditions. These were derived from the network of HCAs developed by the ISC. Category 1 DCAs will be adequate to support at least 20 breeding pairs of owls, and category 2 DCAs will support one to 19 pairs.

dispersal - the movement, usually one way and on any time scale, of plants or animals from their point of origin to another location where they subsequently produce offspring.

down tree, or down log - portion of a tree that has fallen or been cut and left in the woods.

ecosystem - an interacting system of organisms considered together with their environment; for example, marsh, watershed, and lake ecosystems.

endangered species - any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the Endangered Species Act of 1973.

Endangered Species Act - the Endangered Species Act of 1973, as amended through 1988. A federal law with the purpose of conserving the ecosystems upon which endangered and threatened species depend.

fecundity - number of female young produced per adult female.

forest matrix - forestland within the range of the northern spotted owl that lies outside of category 1 and 2 designated conservation areas.

FWS - Fish and Wildlife Service, U.S. Department of the Interior

habitat - the place where a plant or animal naturally or normally lives and grows.

HCA (habitat conservation area) - as proposed by the Interagency Scientific Committee, a contiguous block of habitat to be managed and conserved for breeding pairs, connectivity, and distribution of owls; application may vary throughout the range according to local conditions.

ISC (Interagency Scientific Committee) - a committee of scientists established by the four major federal land management agencies, and mandated by the U.S. Congress in 1989, to develop a conservation strategy for the northern spotted owl.

managed forest - refers to any forestland, including owl habitat, that is treated with silvicultural practices and/or harvested. Generally applied to land that is harvested on a scheduled basis and contributes to an allowable sale quantity.

managed pair areas - a core habitat area, plus additional acreage of suitable habitat around the core, in some portions of the range where it is necessary to provide additional protection for matrix pairs of owls and territorial singles. The acreage to be delineated around the core varies throughout the range, based on data for pairs in that area. The suitable acreage must be delineated within an area equal to the median home range for that province. Appropriate silvicultural treatment is encouraged in suitable and unsuitable habitat in the acreage around the core.

managed stand - see definitions of stand and managed forest.

matrix (see forest matrix)

O&C Act - "The Act of August 28, 1937," the law which placed millions of acres of former railroad grant lands in Oregon under the U.S. Department of the Interior (managed today by the Bureau of Land Management) and directed that they be managed "for permanent forest production . . .." The act also resulted in the current distribution of funds from sale of timber from these lands, with 50 percent of receipts divided among the 18 O&C counties. The O&C in the common name of the law refers to the Oregon & California Railroad.

old-growth (as in old-growth forest) - a forest stand with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; a high incidence of large trees with large, broken tops, and other indications of decadence; numerous large snags; and heavy accumulations of logs and other woody debris on the ground.

province - in the recovery plan, 11 provinces are recognized, based on physiographic provinces with acknowledgment of political boundaries and their differing laws. A physiographic province is a geographic region where climate and geology have given rise to a distinct array of landforms. Biology and habitat relationships of northern spotted owls vary by physiographic province due to differences in climate, vegetation, and productivity of habitats.

range (of a species) - the area or region over which an organism occurs.

recovery (as in the Endangered Species Act) - a condition at which a species no longer needs the protections of the act.

reserved pair areas - areas of suitable habitat identified for pairs and territorial single owls. In those portions of the species' range where habitat and owl populations were inadequate to apply the criteria creating category 1 and 2 DCAs, individual pair areas also are reserved. The acreage of these areas varies throughout the range, based on data for pairs in each province. All suitable habitat is reserved within an area equal to the median home range for that province.

residual habitat area - a 100-acre area of nesting; roosting, and foraging habitat encompassing the activity center for a pair or territorial single owl in the matrix.

roost (as in roost sites or roosting habitat) - an area where a bird finds suitable resting conditions.

salvage - unscheduled harvest of trees killed by storm, insect infestation, or disease.

Section 7 - the section of the Endangered Species Act that specifies the roles of interagency coordination in accomplishing the objective of species protection and recovery.

silviculture - the science and practice of controlling the establishment, composition, and growth of forests.

species - 1) a group of individuals that have their major characteristics in common and are potentially interfertile. 2) the Endangered Species Act defines species as including any species or subspecies of plant or animal. Distinct populations of vertebrates also may be treated as species under the act.

stand (as in timber stand) - an aggregation of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition as to be distinguishable from the forest in adjoining areas.

take - under section 7 and section 9 of the Endangered Species Act, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect an animal, or to attempt to engage in any such conduct.

threatened species - a plant or animal species likely to become an endangered species throughout all or a significant portion of its range within the foreseeable future. A plant or animal species identified by the Secretary of the Interior as threatened, in accordance with the Endangered Species Act.

township - a U.S. land survey unit, 6 miles square, containing 36 mile-square sections.

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